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Hatazaki

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(54) **IMAGE HEATING APPARATUS WITH CLEANING WEB CONFIGURED TO CLEAN COLLECTING ROLLER**

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CPC ***G03G 15/2025*** (2013.01)

(58) **Field of Classification Search**
USPC 399/34, 71, 123, 129, 320, 326, 327, 399/329
See application file for complete search history.

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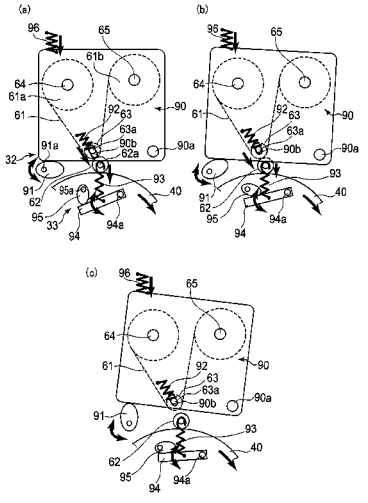
(74) *Attorney, Agent, or Firm* — Fitzpatrick, Cella, Harper & Scinto

(57) **ABSTRACT**

An image hearing apparatus includes: a rotatable heating member; a rotatable collecting member; a cleaning unit including a cleaning web; a moving mechanism configured to move the cleaning unit between a first position where the cleaning web contacts the rotatable collecting member and a second position where the cleaning web contacts the rotatable collecting member at a contact pressure lower than a contact pressure at the first position; and an urging portion. The cleaning unit also includes a first pressing potion configured to press the rotatable collecting member toward the rotatable heating member in contact with the rotatable collecting member when the cleaning unit is in the first position, and includes a second pressing portion configured to press the rotatable collecting member toward the rotatable heating member in contact with the urging portion without contacting the rotatable collecting member when the cleaning unit is in the second position.

7 Claims, 8 Drawing Sheets



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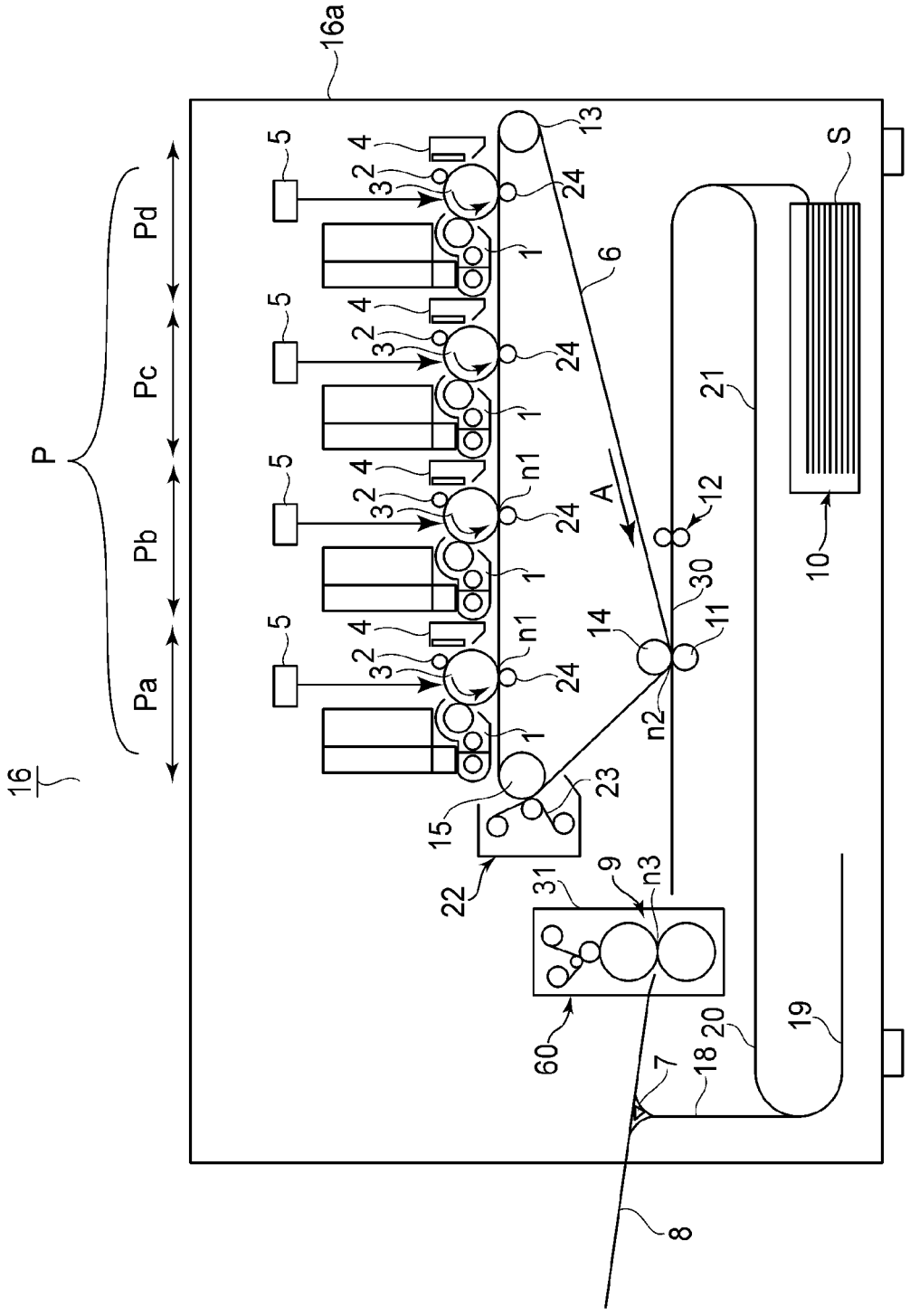
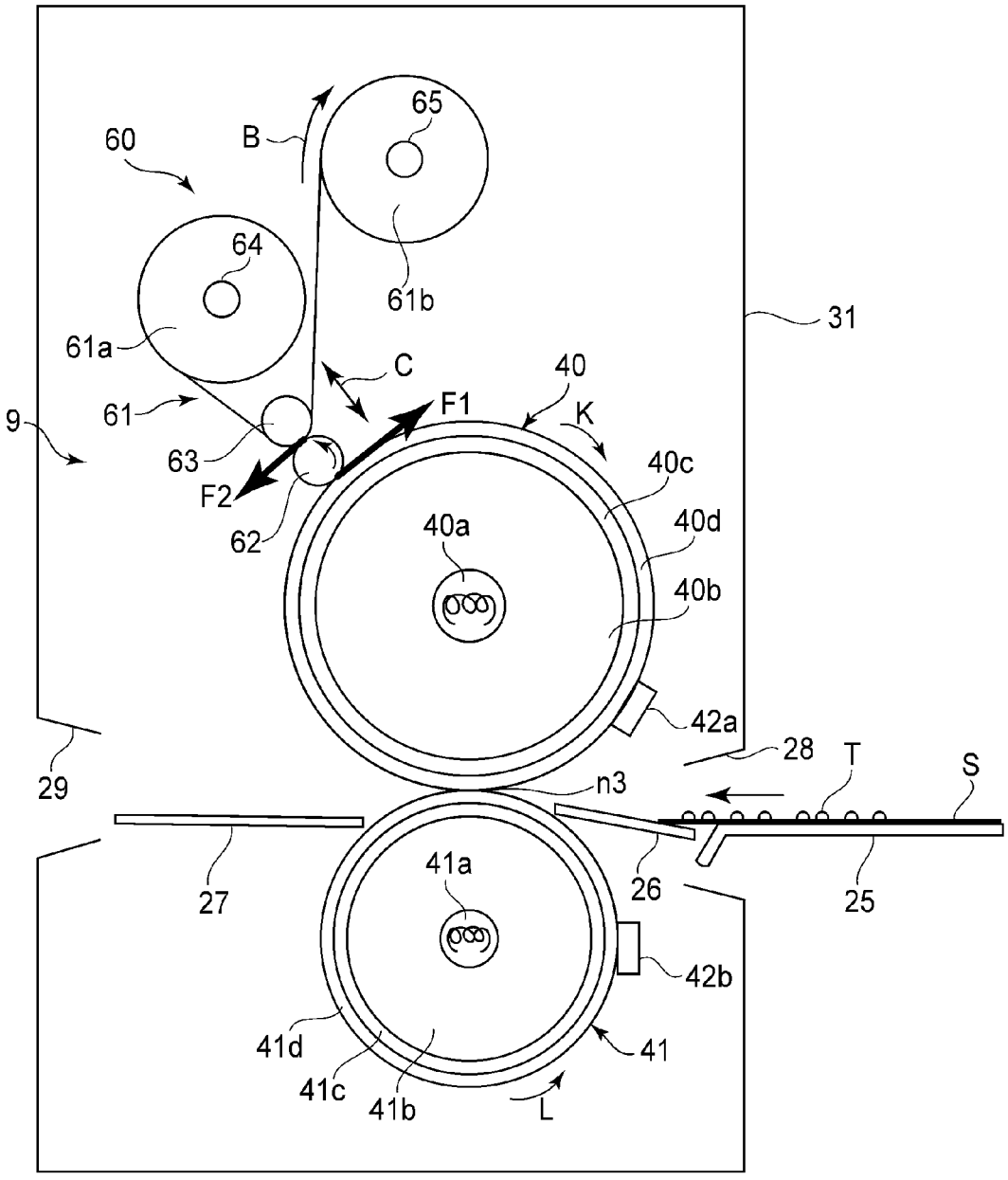

16a
P
Pa
Pb
Pc
Pd
16
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
18
19
20
21
22
23
24
30
31
60
A
S
n1
n2
n3

FIG. 1


60
B
65
64
61b
61a
31
C
40
9
61
F1
K
63
F2
40c
62
40a
40d
40b
42a
28
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29
n3
41a
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26
25
42b
41d
41
41c
41b
L

FIG.2

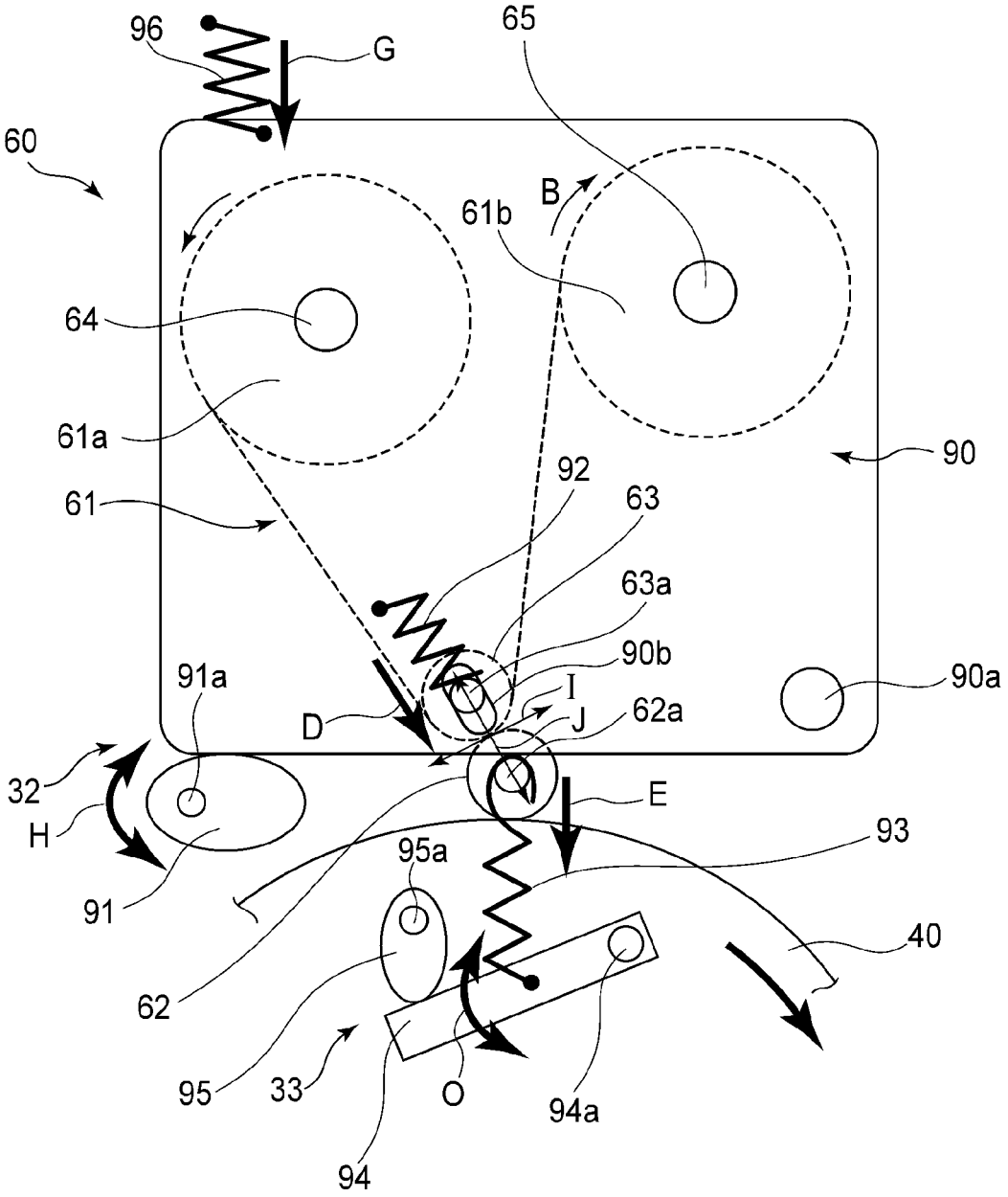

96
G
65
60
B
61b
64
61a
90
92
61
63
63a
90b
91a
I
90a
D
J
62a
32
E
H
93
95a
91
40
62
95
33
O
94a
94

FIG.3

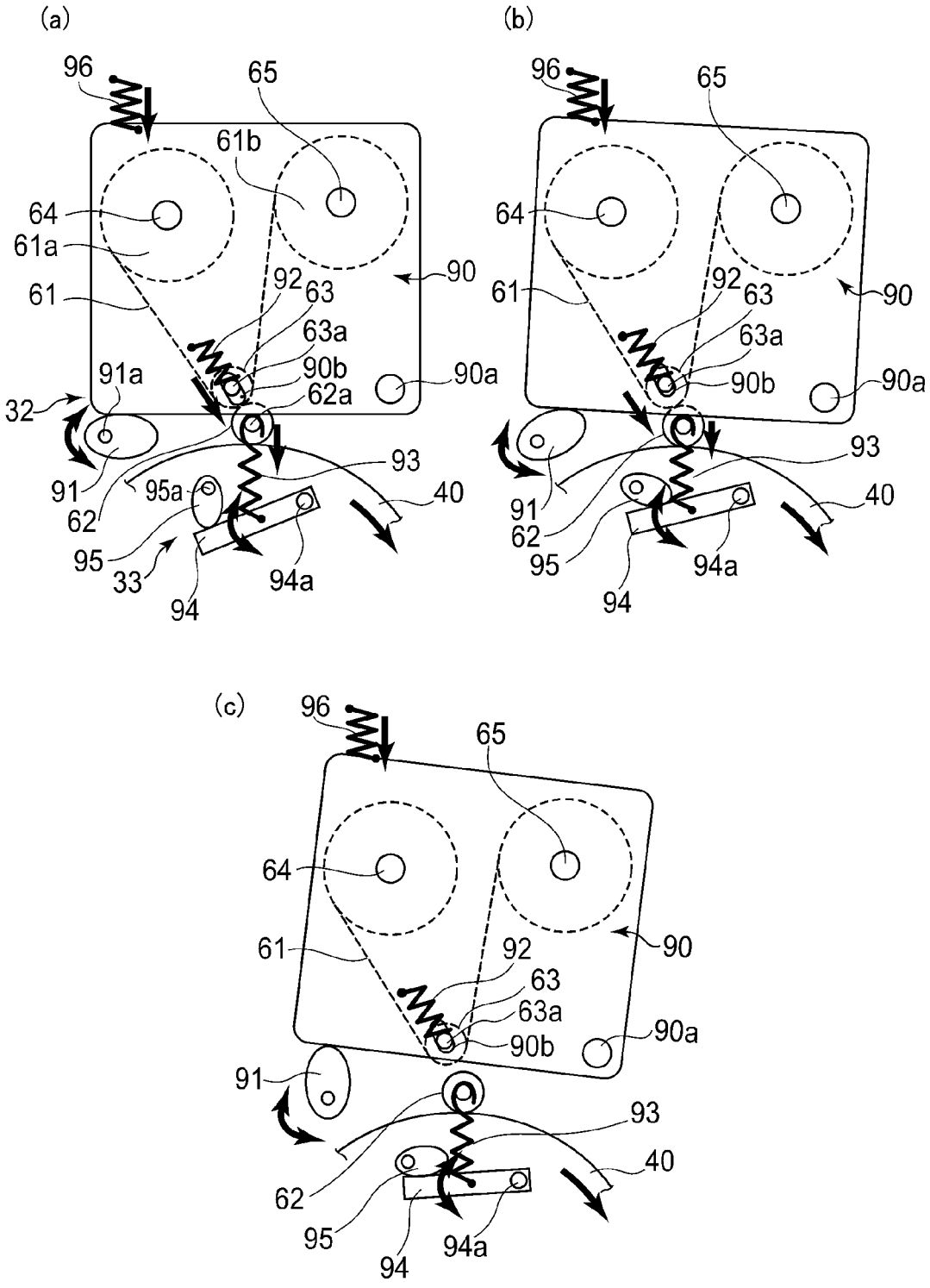

(a)
96
65
61b
64
61a
61
92
63
63a
90
91a
90b
90a
62a
32
93
91
95a
40
62
95
33
94a
94
(b)
96
65
64
61
92
63
63a
90
90b
90a
93
91
40
62
95
94a
94
(c)
96
65
64
61
92
90
63
63a
90b
90a
91
93
40
62
95
94
94a

FIG. 4

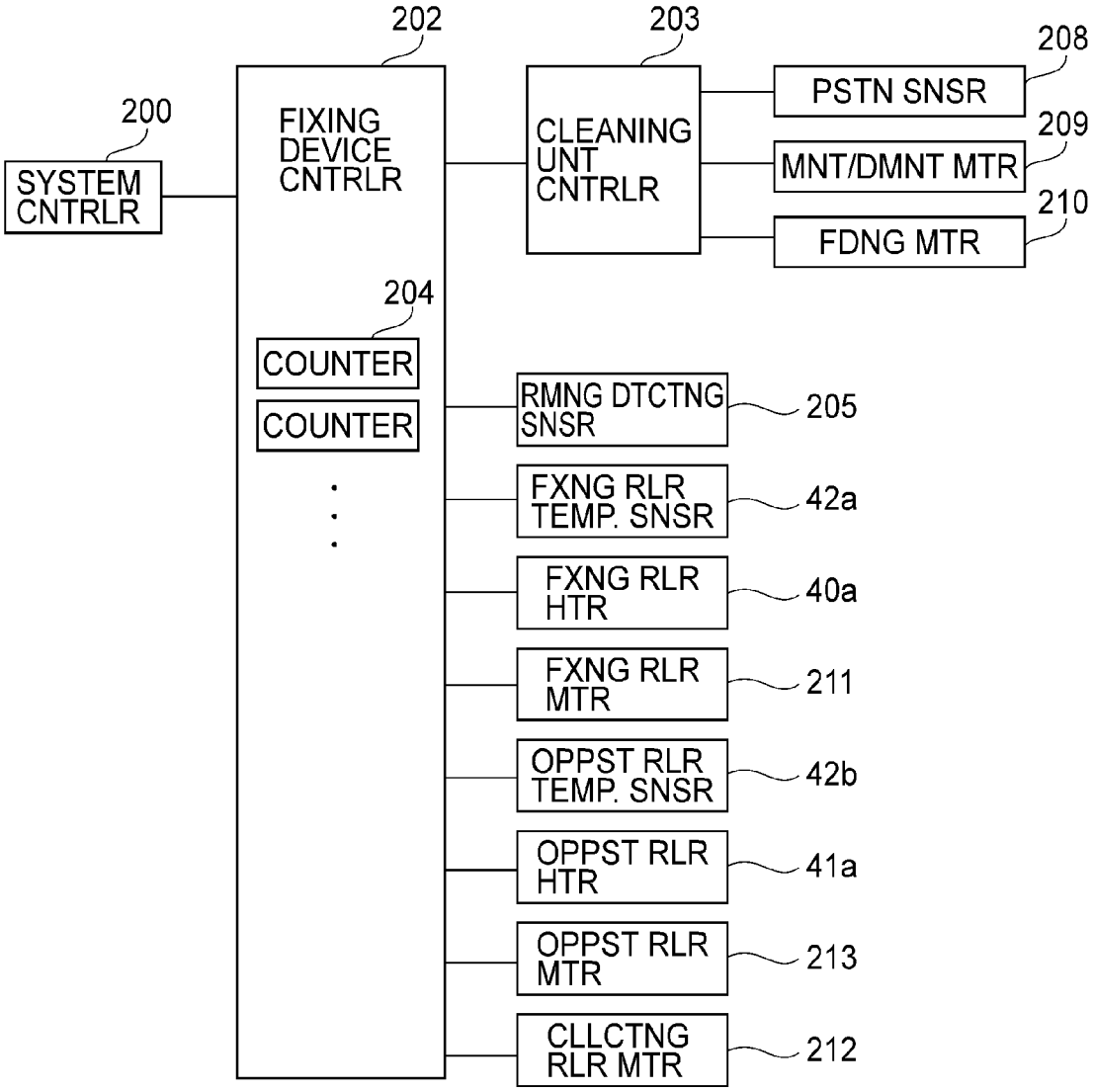

202
203
208
200
FIXING DEVICE CNTRLR
CLEANING UNT CNTRLR
PSTN SNSR
209
SYSTEM CNTRLR
MNT/DMNT MTR
210
FDNG MTR
204
COUNTER
COUNTER
RMNG DTCTNG SNSR
205
FXNG RLR TEMP. SNSR
42a
FXNG RLR HTR
40a
FXNG RLR MTR
211
OPPST RLR TEMP. SNSR
42b
OPPST RLR HTR
41a
OPPST RLR MTR
213
CLLCTNG RLR MTR
212

FIG.5

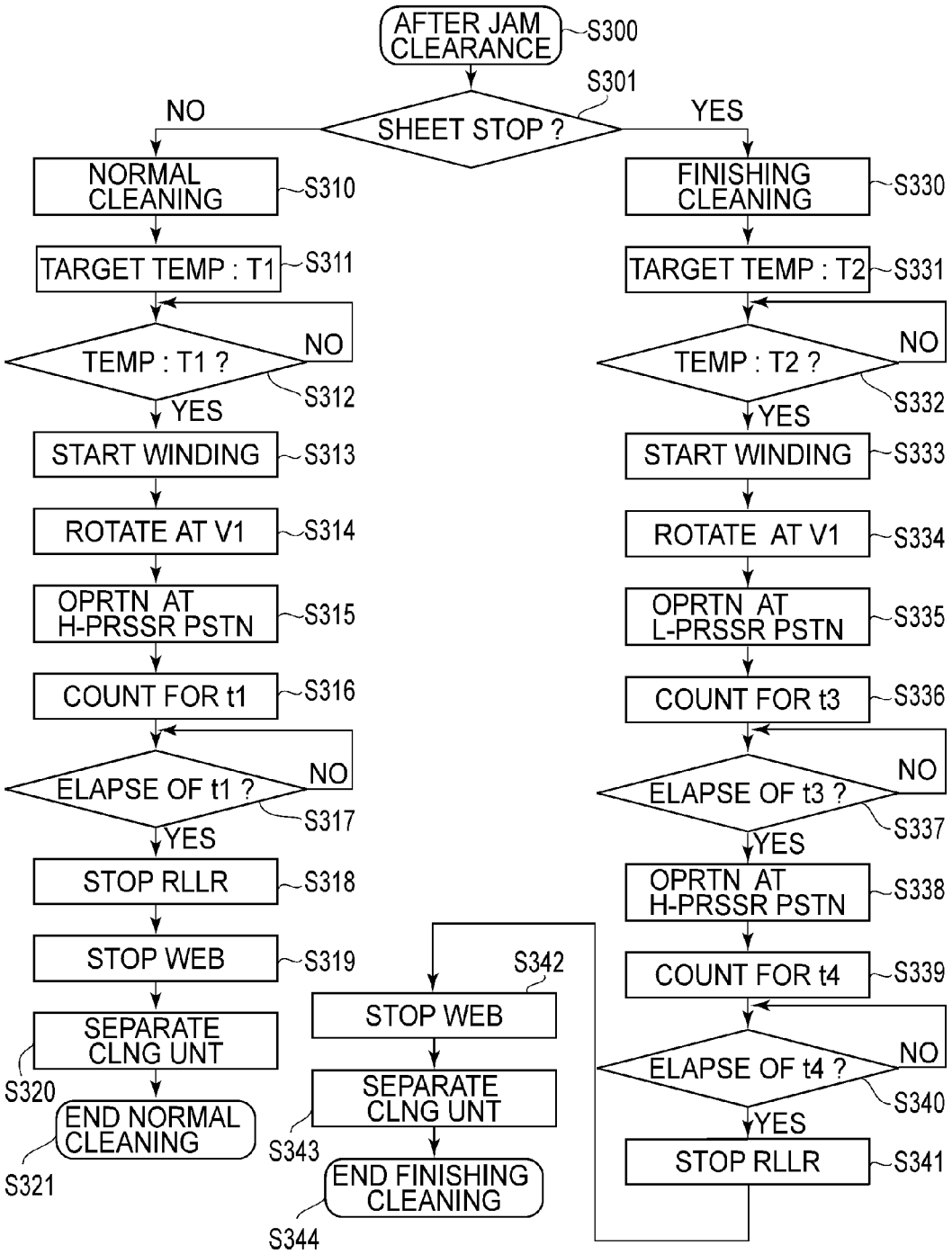
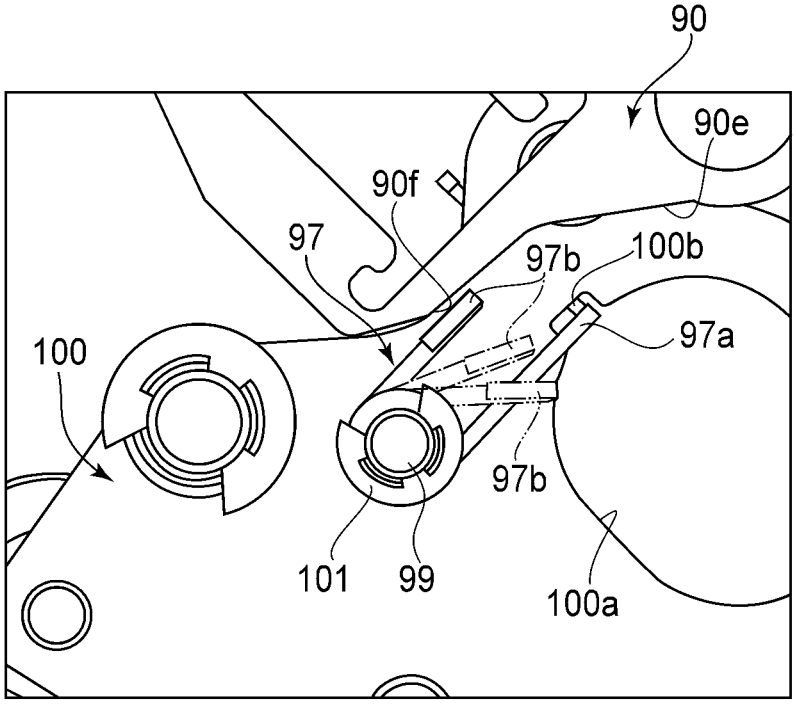

AFTER JAM CLEARANCE
S300
S301
SHEET STOP ?
NO
YES
NORMAL CLEANING
S310
TARGET TEMP : T1
S311
TEMP : T1 ?
NO
S312
YES
START WINDING
S313
ROTATE AT V1
S314
OPRTN AT H-PRSSR PSTN
S315
COUNT FOR t1
S316
ELAPSE OF t1 ?
NO
S317
YES
STOP RLLR
S318
STOP WEB
S319
SEPARATE CLNG UNT
S320
END NORMAL CLEANING
S321
FINISHING CLEANING
S330
TARGET TEMP : T2
S331
TEMP : T2 ?
NO
S332
YES
START WINDING
S333
ROTATE AT V1
S334
OPRTN AT L-PRSSR PSTN
S335
COUNT FOR t3
S336
ELAPSE OF t3 ?
NO
S337
YES
OPRTN AT H-PRSSR PSTN
S338
COUNT FOR t4
S339
ELAPSE OF t4 ?
NO
S340
YES
STOP RLLR
S341
S342
STOP WEB
SEPARATE CLNG UNT
S343
END FINISHING CLEANING
S344

FIG.6

(a)


90
90e
90f
97
97b
100b
97a
100
97b
101
99
100a

(b)

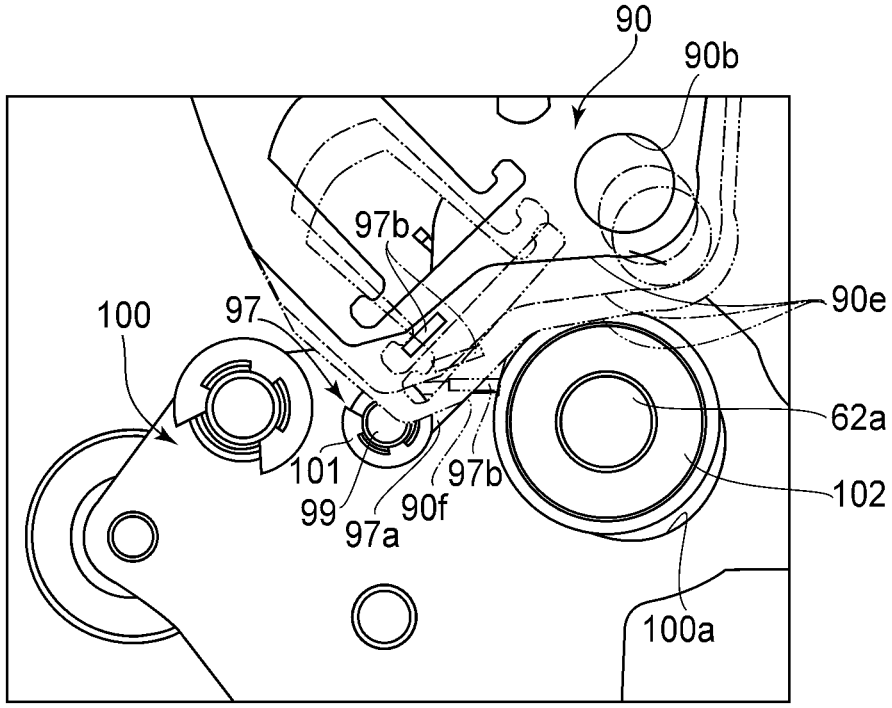

90
90b
97b
100
97
90e
62a
101
97b
99
90f
97a
102
100a

FIG.7

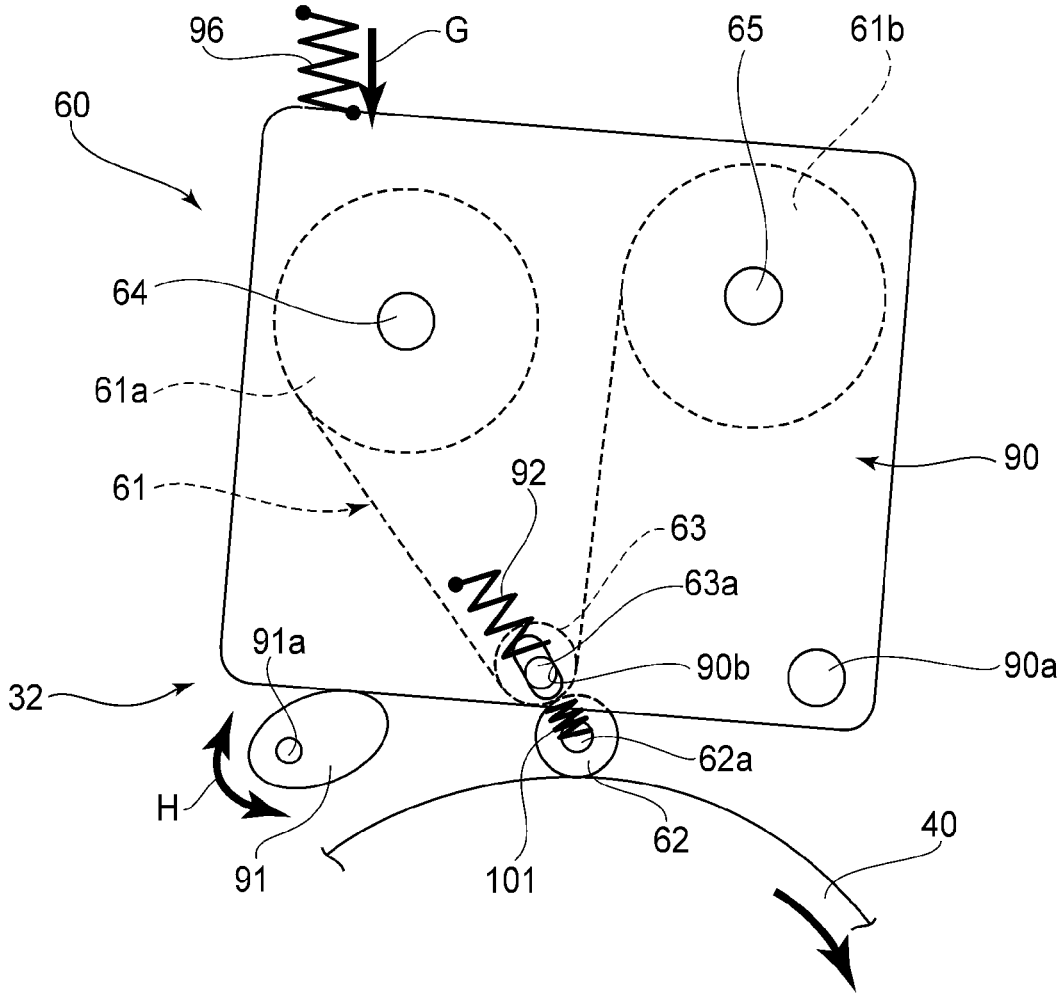

96
G
65
61b
60
64
61a
61
92
63
63a
90
91a
90b
90a
32
62a
H
62
40
91
101

FIG.8

IMAGE HEATING APPARATUS WITH CLEANING WEB CONFIGURED TO CLEAN COLLECTING ROLLER

FIELD OF THE INVENTION AND RELATED ART

The present invention relates to an image heating apparatus. This image heating apparatus is used in an image forming apparatus such as a copying machine, a printer, a facsimile machine and a multi-function machine having a plurality of functions of these machines.

In a conventional image forming apparatus of an electrophotographic type, a toner image formed on a recording material is fixed by a fixing device (image heating apparatus).

In such a fixing device, e.g., in the case where a jam is generated, there is a liability that a large amount of toner is offset on a fixing roller (rotatable heating member), and therefore a mechanism for cleaning the fixing roller is provided (Japanese Laid-Open Patent Application (JP-A) Hei 6-194986). Specifically, a constitution in which the fixing roller is cleaned using a cleaning web is employed.

Further, there is a liability that the fixing roller is damaged by foreign matter sandwiched between the fixing roller and the web, and therefore a constitution in which a collecting roller is interposed between the fixing roller and the web has been proposed (JP-A 2004-212409). Specifically, the offset toner is once collected from the fixing roller onto the collecting roller, and then the collected offset toner is cleaned with the web.

However, in the case where the toner is offset by a large amount on the fixing roller with the generation of the jam, in order to resume image formation quickly, the larger amount of offset toner is required to be removed in a short time.

SUMMARY OF THE INVENTION

According to an aspect of the present invention, there is provided an image hearing apparatus comprising: a rotatable heating member configured to heat a toner image on a recording material; a rotatable collecting member configured to collect a toner deposited on the rotatable heating member while being rotated by the rotatable heating member; a cleaning unit including a cleaning web configured to clean the rotatable collecting member; a moving mechanism configured to move the cleaning unit so as to be movable between a first position where the cleaning web contacts the rotatable collecting member and a second position where the cleaning web contacts the rotatable collecting member at a contact pressure lower than a contact pressure at the first position; and an urging portion configured to urge the rotatable collecting member toward the rotatable heating member. The cleaning unit also includes a first pressing potion configured to press the rotatable collecting member toward the rotatable heating member in contact with the rotatable collecting member when the cleaning unit is in the first position, and includes a second pressing portion configured to press the rotatable collecting member toward the rotatable heating member in contact with the urging portion without contacting the rotatable collecting member when the cleaning unit is in the second position.

According to another aspect of the present invention, there is provided an image hearing apparatus comprising: a rotatable heating member configured to heat a toner image on a recording material; a rotatable collecting member configured to collect a toner deposited on the rotatable heating member while being rotated by the rotatable heating member; a cleaning unit including a cleaning web configured to clean the rotatable collecting member; and a moving mechanism configured to move the cleaning unit so as to be movable between a first position where the cleaning web contacts the rotatable collecting member and a second position where the cleaning web contacts the rotatable collecting member at a contact pressure lower than a contact pressure at the first position. When the cleaning unit is in the first position or in the second position, the frictional force between the rotatable collecting member and the rotatable heating member is larger than the frictional force between the cleaning web and the rotatable collecting member.

According to a further aspect of the present invention, there is provided an image hearing apparatus comprising: a rotatable heating member configured to heat a toner image on a recording material; a rotatable collecting member configured to collect a toner deposited on the rotatable heating member while being rotated by the rotatable heating member; a cleaning unit including a cleaning web configured to clean the rotatable collecting member; and an urging portion configured to urge the rotatable collecting member toward the rotatable heating member. The cleaning unit includes a first pressing potion configured to press the rotatable collecting member toward the rotatable heating member in contact with the rotatable collecting member, and includes a second pressing portion configured to press the rotatable collecting member toward the rotatable heating member in contact with the urging portion without contacting the rotatable collecting member.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic sectional view of an image forming apparatus in a First Embodiment.

FIG. **2** is a sectional view showing a structure of a fixing device in the First Embodiment.

FIG. **3** is a schematic view showing a moving mechanism for moving a web roller toward and away from a collecting roller in the First Embodiment.

In FIG. **4**,(*a*) to (*c*) are schematic views each showing a state of the mounting means for the collecting roller and the web roller at a the position in the First Embodiment.

FIG. **5** is a block diagram showing a control system in the First Embodiment.

FIG. **6** is a flowchart relating to a cleaning process in the First Embodiment.

In FIGS. **7**,(*a*) and (*b*) are schematic views for illustrating an operating state of a pressing portion in a Second Embodiment.

FIG. **8** is a schematic view showing a moving mechanism for moving a web roller toward and away from a collecting roller in a Third Embodiment.

DESCRIPTION OF THE EMBODIMENTS

<First Embodiment>

A First Embodiment of the present invention will be described with reference to the drawings. In this embodiment, a constitution in which an image heating apparatus is used as a fixing device for fixing an unfixed toner image on

a sheet (recording material) will be described, but the present invention can also be carried out as a heat treatment device for adjusting an image surface property by heating the recording material on which a fixed image or a partly fixed image is carried.

Incidentally, the dimensions, materials and shapes of constituent elements and their relative arrangements and the like described in the following embodiments should be changed appropriately depending on structures and various conditions of apparatuses (devices) to which the present invention is applied, and the present invention is not intended to be limited to the following embodiments.

First, a color electrophotographic printer as an image forming apparatus in this embodiment will be described with reference to FIG. **1**. FIG. **1** shows the color electrophotographic printer in a state of a cross section along a feeding direction of the sheet. In the following embodiments, the color electrophotographic printer is simply referred to as a printer.

[Printer]

As shown in Embodiment 1, a printer **16** includes a printer main assembly **16***a* provided with image forming portions Pa, Pb, Pc and Pd corresponding to the colors of Y (yellow), M (magenta), C (cyan) and Bk (black), respectively. The image forming portions Pa, Pb, Pc and Pd are different in the colors of toners used as Y, M, C and Bk, respectively, but the same structure is employed. For this reason, these image forming portions will be described as a common image forming portion P.

The image forming portion P includes an electrophotographic photosensitive drum **3** and members, including a charger **2**, a laser scanner **5**, a developing device **1**, a primary transfer roller **24** and a drum cleaner **4**, which are provided in the listed order along a rotational direction of the photosensitive drum **3**.

In each image forming portion P, the photosensitive drum **3** is electrically charged by the charger in advance, and thereafter an electrostatic latent image is formed by the laser scanner **5**. In the laser scanner **5**, unshown light source device and polygon mirror are provided. Laser light emitted from the light source device is used to scan the surface of the photosensitive drum **3** with the polygon mirror, and light fluxes of the scanning light is deflected by a reflection mirror and are focused on a generatrix of the photosensitive drum **3** by an unshown fθ lens to expose the photosensitive drum surface, so that the electrostatic latent image depending on an image signal is formed on the photosensitive drum **3**.

Then, the electrostatic latent image is visualized as a toner image by the developing device **1**. That is, in the developing device **1**, as a developer, a toner of a corresponding color is filled in a predetermined amount by an unshown supplying device. Each developing device **1** develops the electrostatic latent image on the corresponding photosensitive drum **3**, and thus visualizes the electrostatic latent image as the toner image of the corresponding color.

The toner used in this embodiment contains (incorporates), a wax consisting of paraffin or polyolefin, or a silicone oil as a parting agent. Specifically, in this embodiment, a toner obtained by finely dispersing a wax component and a pigment into a pulverized toner is used. A constitution in which a polymerization toner containing such a wax component is used may also be employed. In the following description, as the parting agent, the wax is described as an example, but as described above, also the case where the silicone oil is used as the parting agent is similarly applied.

The toner images, corresponding to the associated colors, formed on the respective photosensitive drums **3** are successively primary-transferred onto an intermediary transfer belt **6** as an image bearing member by primary transfer rollers **24**. That is, in a process in which the toner image formed and carried on the associated photosensitive drum **3** passes through a primary transfer nip n**1** between the photosensitive drum **3** and the intermediary transfer belt **6**, the toner image is intermediately transferred onto an outer peripheral surface of the intermediary transfer belt **6** by pressure and an electric field formed by a primary transfer bias applied to the intermediary transfer belt **6**. After this primary transfer, a transfer residual toner remaining on the photosensitive drum **3** is removed by cleaning with the drum cleaner **4**, and therefore the surface of the photosensitive drum **3** is cleaned and can prepare for subsequent image formation.

On the other hand, a recording material S is fed one by one from a sheet feeding cassette **10** and then is sent into a registration roller pair **12**. The registration roller pair **12** once receives the recording material S and corrects oblique movement of the recording material S. Then, the registration roller pair **12** sends the recording material to a secondary transfer nip n**2** between the intermediary transfer belt **6** and a secondary transfer roller **11** in synchronism with the toner image on the intermediary transfer belt **6**. The intermediary transfer belt **6** is constituted so that the intermediary transfer belt **6** is rotatable at the same peripheral speed as those of the photosensitive drums **3** in an arrow A direction by stretching rollers **13**, **14** and **15**.

The color toner images on the intermediary transfer belt **6** are secondary-transferred onto the recording material S at the secondary transfer nip n**2** by the secondary transfer roller **11**. The secondary transfer roller **11** is shaft-supported in parallel with the intermediary transfer belt **6** correspondingly to the intermediary transfer belt **6**, and is supported in a state in which the secondary transfer roller **11** contacts a lower surface of the intermediary transfer belt **6**. To the secondary transfer roller **11**, a desired secondary transfer bias is applied by a secondary transfer bias (voltage) source (not shown). The secondary transfer, onto the recording material S, of the four color toner images superposedly transferred as a synthetic color toner image is carried out in the following manner. That is, the recording material S fed from the sheet feeding cassette **10** passes through the registration roller pair **12** and a pre-transfer guide **30** and then is fed to the secondary transfer nip n**2** at predetermined timing, and at the same time, the secondary transfer bias is applied from the bias (power) source to the secondary transfer roller **11**, whereby the secondary transfer is carried out.

By this secondary transfer bias, the synthetic color toner image is secondary-transferred from the intermediary transfer belt **6** onto the recording material S. The synthetic color toner image is formed on the recording material S while leaving a certain in margin from each of four edges of the recording material S. In this embodiment, a leading end portion margin is about 2-3 mm. A transfer residual toner and another foreign matter are wiped off by rubbing the surface of the intermediary transfer belt **6** with a cleaning web **23** consisting of a nonwoven fabric in a belt cleaner **22**.

Then, the recording material S on which the toner images are secondary-transferred is introduced successively into a heating nip n**3** of the fixing device **9**, so that the toner images on the recording material (sheet) S is fixed by being heated and pressed at the heating nip n**3**. As a specific example of the recording material S on which the toner image is to be formed, it is possible to use plain paper, a resin-made sheet

material as an alternative to the plain paper, thick paper, a recording material for an overhead projector, and the like.

In the case where the toner image is formed on one surface of the recording material S, depending on a condition, a feeding path is switched by a switching member (flapper) **7**. On the other hand, in the case where the toner image is formed on double (both) surfaces of the recording material S, the recording material S on which the toner image is fixed by the fixing device **9** is guided onto a discharge tray **8** by the switched switching member **7**. Then, when a trailing end of the recording material S reaches a reversing point, the recording material S is fed along switch-back feeding paths **18**, **19** and **20** in a switch-back manner, and is turned upside down. Thereafter, the recording material S is fed along a feeding path **21** for double-side printing, and then is subjected to the same process as that during one-side image formation (printing), so that the toner image is formed on the other (back) surface, and then is discharged on the discharge tray **8**.

Incidentally, in the case of a printer having a monochromatic (Bk single color) structure, only the photosensitive drum **3** for black in the above-described exists, and the toner image formed on the photosensitive drum **3** is constituted s as to be transferred onto the recording material by the transfer device.

The fixing device **9** in this embodiment has a constitution in which the toner image formed on the recording material S by using the toner containing the parting agent is fixed on the recording material S by being heated and pressed. The constitution will be specifically described.

[Fixing Device]

Next, the fixing device **9** as the image heating apparatus will be described with reference to FIGS. **2** to **4**. FIG. **2** is a sectional view showing a structure of the fixing device **9** in this embodiment, FIG. **3** is a schematic view showing a moving mechanism **32** for moving a web roller **63** toward and away from a collecting roller **62**, and (a) to (c) of FIG. **4** are schematic views each showing a state of the moving mechanism **32** at a position.

As shown in FIG. **2**, inside a casing **31** supported in the printer main assembly **16***a*, the fixing device **9** including a cleaning unit **60** provided at an upper portion is disposed. The cleaning unit **60** includes, as described later, a cleaning web **61** for cleaning a collecting roller **62** as a rotatable collecting member by slide with the collecting roller **62**. In the fixing device **9**, an opposite roller **41** as a rotatable opposite member is press-contacted to a fixing roller **40** as a rotatable heating member, for heating a toner image on the recording material, at a total pressure of, e.g., about 784 (N) (about 80 (kg)), so that the heating nip n**3** of the recording material S is formed.

In this way, the opposite roller (rotatable opposite member) **41** is contacted to the fixing roller (rotatable heating member) **40**, so that the heating nip n**3** for heating the image (toner image) on the recording material S. In the fixing device **9**, the (unfixed) toner image T secondary-transferred on the recording material S is nipped and fed in the heating nip n**3** between the fixing roller **40**, to be contacted to the image surface, and the opposite roller **41**, and thus is fixed on the recording material S. Referring to FIG. **2**, in front of the develop **9**, pre-fixing guides **25** and **26** are provided, and behind the fixing device **9**, a post-fixing guide **27** is provided. Further, the recording material S is fed into the fixing device **9** through an entrance opening **28** and comes out of the fixing device **9** through an exit opening **29**.

The fixing roller **40** is constituted as a cylindrical shape having, e.g., a diameter of 60 mm by disposing, e.g., a 3 mm-thick elastic layer **40***c* on an outer peripheral surface of an aluminum cylindrical core metal **40***b*. A lower layer of the elastic layer **40***c* is a HTV (high-temperature vulcanizing) silicone rubber layer, and on an outer peripheral surface of the HTV silicone rubber layer, an RTV (room-temperature vulcanizing) silicone rubber layer as a heat-resistant elastic layer **40***d* to be contacted to the image surface is disposed.

On the elastic layer **40***c*, in order to improve a parting property with the toner, a fluorine-containing resin material (PFA tube in this embodiment) as a heat-resistant parting layer **40***d* is coated. Further, at a center portion of the core metal **40***b* of the fixing roller **40** a fixing roller heater **40***a* consisting of a halogen heater, having predetermined rated electric power, for heating the fixing roller **40** from an inside so that a surface temperature of the fixing roller **40** becomes a predetermined temperature is provided non-rotatably.

On the other hand, the opposite roller **41** disposed so as to oppose the fixing roller **40** is constituted as a cylindrical shape having, e.g., a diameter of 60 mm by disposing, e.g., a 1 mm-thick elastic layer **41***c* on an outer peripheral surface of an aluminum cylindrical core metal **41***b*. A lower layer of the elastic layer **41***c* is a HTV silicone rubber layer, and on an outer peripheral surface of the HTV silicone rubber layer, a fluorine-containing resin layer is disposed.

On the elastic layer **41***c*, in order to improve a parting property with the toner, a heat-resistant parting layer **41***d* is coated. Further, at a center portion of the core metal **41***b* of the opposite roller **41**, an opposite roller heater **41***a* having predetermined rated electric power, for heating the opposite roller **41** from an inside so that a surface temperature of the opposite roller **41** becomes a predetermined temperature is provided non-rotatably.

In this embodiment, by combining the fixing roller **40** and the opposite roller **41** each having the above-described layer structure, the parting property against a sharp-melt toner is further improved. Further, in order to fix double-side images, not only at the surface of the fixing roller **40** but also at the surface of the opposite roller **41**, the above-described parting layer (**40***d* or **41***d*) of RTV or LTV (low-temperature vulcanizing) silicone rubber or the like having a high toner parting effect is provided.

Each of the fixing roller **40** and the opposite roller **41** is rotatably supported at end portions thereof by ball bearings (not shown). Each of the fixing roller **40** and the collecting roller **41** is provided with a gear (not shown) at one of shaft end portions thereof, and these gears of the rollers **40** and **41** are connected with each other by a gear mechanism (not shown), so that the rollers **40** and **41** are rotationally driven integrally by an unshown driving mechanism in arrow K and L directions, respectively.

In the casing **31**, a fixing roller temperature detecting sensor (detecting device) **42***a* such as a thermistor is provided so as to detect a surface temperature of the fixing roller **40** in contact with the surface of the fixing roller **40**. The fixing roller temperature detecting sensor **42***a* is disposed upstream of the heating nip n**3** with respect to the rotational direction of the fixing roller **40**. The fixing roller temperature detecting sensor **42***a* is connected with a fixing device controller **202** (FIG. **5**). The fixing device controller **202** adjusts electric power supplied to the fixing roller heater **40***a* so that the surface temperature of the fixing roller **40** detected by the fixing roller temperature detecting sensor **42***a* converges to a predetermined (e.g., about 165° C.).

In the casing **31**, an opposite roller temperature detecting sensor **42***b* such as a thermistor is provided so as to detect a surface temperature of the opposite roller **41** in contact with the surface of the opposite roller **41**. The opposite roller

temperature detecting sensor **42***b* is disposed upstream of the heating nip n**3** with respect to the rotational direction of the opposite roller **41**. The opposite roller temperature detecting sensor **42***b* is connected with the fixing device controller **202**. The fixing device controller **202** adjusts electric power supplied to the opposite roller heater **41***a* so that the surface temperature of the opposite roller **41** detected by the opposite temperature detecting sensor **42***b* converges to a predetermined (e.g., about 140° C.).

[Cleaning Unit]

As shown in FIGS. **2** and **3**, the cleaning unit **60** for cleaning the fixing roller **40** brings the collecting roller **62** as a rotatable cleaning member formed of stainless steel (SUS 303) in an outer diameter of, e.g., 20 (mm) into contact with the fixing roller **40** so as to be rotatable by rotation of the fixing roller **40**. The collecting roller **62** collects the toner by rotating while sliding with the fixing roller **40**. Further, the cleaning unit **60** includes a cleaning web **61** formed with a nonwoven fabric. The web **61** constitutes a cleaning web for cleaning the surface of the collecting roller **62** in contact with the collecting roller **62**.

The collecting roller **62** is rotatably supported by a rotation shaft **62***a* supported at end portions by the casing **31**, and is also constituted so that pressure to be applied to the fixing roller (rotatable member) **40** is capable of being switched by a pressure switching mechanism **33** as a first switching means. The pressure switching mechanism **33** is constituted by a collecting roller urging spring **95** as a first urging member, a collecting roller urging arm **94** as a first rotatable member and a collecting roller urging cam **95** as a first cam member which are described later.

The cleaning urging spring **93** is mounted at one end portion thereof on a rotation shaft **62***a* of the collecting roller **62** so as at urge the collecting roller **62** toward the fixing roller (rotatable member) **40**. The collecting roller urging arm **94** rotates in a state in which the collecting roller urging arm **94** supports the other end portion of the collecting roller urging spring **93**, thus changing an urging force applied to the collecting roller **62**. The collecting roller urging cam **95** rotates so as to change an amount of rotation of the collecting roller urging arm **94**. In such a simple constitution, the fixing device controller **202** controls an angle of rotation of the collecting roller urging cam **95**, so that an operation of the pressure switching mechanism **33** can be properly controlled.

In the case where the toner is peeled off from the recording material S and is deposited as an offset toner (residual toner) on the fixing roller **40**, the collecting roller **62** cleans the fixing roller **40** and collects the offset toner from the fixing roller **40**. The collecting roller **62** is always contacted to the fixing roller **40** for the purpose of collecting a deposited matter such as a foreign matter on the surface of the fixing roller **40** also in a period other than during the image formation.

In this embodiment, a constitution in which the collecting roller **62** is contacted to the fixing roller **40** to clean the surface of the fixing roller **40** is employed. However, the present invention is not limited thereto, and a constitution in which the collecting roller **62** is contacted to the opposite roller **41** to clean the surface of the opposite roller **41** may also be employed. In this case, the opposite roller **41** constitutes a rotatable heating member in the present invention. Also in this case, an effect similar to that in the case where the collecting roller **62** is contacted to the fixing roller **40** can be obtained. Such a constitution is also applicable to a modified embodiment described later.

The cleaning unit **60** includes a feeding (sending) roller **64** about which a feeding end portion **61***a* of the web **61** is wound and a winding-up roller **65** for winding up a winding end portion **61***b* of the web **61** fed from the feeding roller **64**. Further, the cleaning unit **60** includes a web roller (urging roller, urging member) for pressing (urging) the cleaning web **61** against the collecting roller **62**. A cleaning member for cleaning the surface of the collecting roller **62** in contact with the collecting roller **62** is constituted by the web **61** and the web roller **63**.

Further, the moving mechanism **32** constitutes a second switching means for switching the pressure of the web roller **63** applied to the collecting roller **62**. The moving mechanism **32** switches the pressure, of the web **61** as the cleaning member and the web roller **63**, applied to the collecting roller **62** as the rotatable cleaning member. The moving mechanism **32** includes, as described later, a web roller urging spring **92** and a unit urging spring **96** which are used as a second urging member, a roller supporting plate **90** as a second rotatable member, a shaft supporting hole **90***b* formed in the plate **90**, a mounting-and-demounting cam **91** as a second cam member, and a compression spring. The shaft supporting hole **90***b* is formed in an elongated shape.

The web roller urging spring **92** and the unit urging spring **96** which are used as the second urging member urge the web roller **63** toward the collecting roller (rotatable cleaning member) **62**. The roller supporting plate **90** as the second rotatable member rotates against or in accordance with urging forces of the web roller urging spring **92** and the unit urging spring **96**, thus changing an urging force applied to the web roller **93**. The mounting-and-demounting cam **91** as the second cam member rotates so as to change an amount of rotation of the roller supporting plate **90**. In such a simple constitution, the fixing device controller **202** controls an angle of rotation of the mounting-and-demounting cam **91**, so that the operation of the moving mechanism **32** can be properly controlled.

Such a moving mechanism **32** switches the urging force so that a second urging force is larger than a first urging force for urging the web **61** against the collecting roller **62** by the web roller **63** is an operation in a first cleaning mode described later. That is, the moving mechanism **32** switches the urging force of the web roller **63** toward the collecting roller **62** so that the second urging force for urging the web **61** against the collecting roller **62** by the web roller **63** in an operation in a second cleaning mode described later is larger than the first urging force.

In the casing **31** in FIG. **2**, the roller supporting plate **90** shown in FIG. **3** is disposed in each of front and rear sides of FIG. **2** correspondingly to associated ones of end portions of the rollers **63**, **64** and **65** of the cleaning unit **60**. By the roller supporting plates **90** and **90** disposed in the front and rear sides, each of the web roller **63**, the feeding roller **64** and the winding-up roller **65** is supported at end portions thereof. The roller supporting plates **90** are supported so as to be rotatable about the unit rotation shaft **90***a* as a fulcrum in the clockwise direction and the counterclockwise direction in FIG. **3**.

The end portions of the cleaning web **61** are rotatably supported by the feeding roller **63** and the winding-up roller **65**, and a web feeding motor **210** (FIG. **5**) for winding up the cleaning web **61** is connected with the cleaning web **61**. When the web feeding motor rotates in a winding-up direction, the winding-up roller **63** winds up the winding-up end portion **61***b*, whereby the web **61** advances in an arrow D direction to pass through the web roller **63**. Then, the feeding

end portion **61***a* is pulled, whereby the feeding roller **64** is rotated. As a result, the cleaning web **61** is gradually wound up in an arrow B direction.

The web roller **63** is provided so that a rotation shaft **63***a* formed of high-rigidity metal (SUS 303) penetrates through a center of the web roller **63** in order to suppress flexure (bending) when the web **61** is pressed against the collecting roller **62** by the web roller **63**. Each of the roller supporting plates **90** provided in the front and rear sides is provided with the shaft supporting holes **90***b* formed at a position opposing the collecting roller **62** contacting an upper portion of the fixing roller **40**. Into these shaft supporting holes **90***b*, end portions of the rotation shaft **63***a* are inserted slidably, respectively. The end portions of the rotation shaft **63***a* of the web roller **63** are urged toward the collecting roller **62** by the web roller urging springs **92** supported at one ends by the roller supporting plates **90** provided in the front and rear sides.

The web roller **63** may preferably have a nip width formed between itself and the collecting roller **62** in order to improve cleaning power by the web **61**, and therefore a silicone sponge which has a heat-resistant property and which is, e.g., 30 mm in diameter is wound around the rotation shaft **63***a*. Further, this silicone sponge is coated with a FPA tube, for preventing deposition of the toner, having a thickness of, e.g., 100 μm.

At an upper portion of the roller supporting plate **90** in a side opposite from the unit rotation shaft **90***a*, the unit urging spring **96** supported at one end thereof by the casing **31** is supported at the other end thereof. At an upper-like portion of the fixing roller **40** in FIG. **3**, an elliptical mounting-and-demounting cam **91** having an eccentric rotation shaft **91***a* which is one of two focuses is disposed so as to be substantially at the same level as the collecting roller **62** with respect to a horizontal direction. The roller supporting plate **90** urged in an arrow G direction by the unit urging spring **96** effects contact and separation (spacing) between the collecting roller **62** and the cleaning web **61** with the unit rotation shaft **90***a* as the fulcrum with rotation of the mounting-and-demounting cam **91** in a state in which a lower-left portion thereof is pressed against the mounting-and-demounting cam **91**.

The rotation shaft **63***a* of the web roller **63** is rotatably and slidably supported by the shaft supporting hole **90***b*. An extension direction of the shaft supporting hole **90***b*, i.e., a slide direction (arrow J direction) of the rotation shaft **63***a* is a direction perpendicular to an extension direction (arrow I direction) of the nip between the web **61** (contacting the web roller **63**) and the collecting roller **62**.

The collecting roller **62** is supported by the casing **31** at end portions of the rotation shaft **62***a* by unshown ball bearings so that the collecting roller **62** is movable in advancing and retracting directions relative to the fixing roller **40**. The collecting roller **62** is constituted so as to be pressed against the fixing roller **40**, while the contact pressure thereof toward the fixing roller **40** is stepwisely switched, by the pressure switching mechanism **33** including the collecting roller urging spring **93**, the collecting roller urging arm **94** and the collecting roller urging cam **95** (FIG. **4**). The collecting roller cam **95** is constituted in an elliptical shape such that one of two focuses thereof is an eccentric rotation shaft **95***a*.

The collecting roller urging spring **93** consisting of a tension spring is supported at one end thereof by an end portion of the rotation shaft **62***a* of the collecting roller **62** and is supported at the other end thereof by a central portion of the collecting roller urging arm **94**. By rotation of the collecting roller urging cam **95**, the urging arm **94** swings about a rotation shaft **94***a* in an arrow O direction. By the swing, an operating length of the collecting roller urging spring **93** changes, so that the pressure of the collecting roller **62** applied to the fixing roller **40** is changed. A variable range of the pressure is set from 0 N to 80 N.

For example, in a state in which the toner is deposited in a large amount on the collecting roller **62**, when the nip pressure between the fixing roller **40** and the collecting roller **62** is excessively high, there is a high possibility that the toner is transferred back to the fixing roller **40**. For that reason, in the case where the toner is large in amount after generation of a jam or the like, the nip pressure between the collecting roller **62** and the fixing roller **40** may preferably be lowered to the possible extent. However, in order to prevent slip of the collecting roller **62**, the contact pressure of the collecting roller **62** may preferably be determined so that a frictional force F**2** between the cleaning web **61** and the collecting roller **62** is smaller than a frictional force F**1** between the collecting roller **62** and the fixing roller **40**.

Therefore, the contact pressure is determined so as to satisfy F**2**<F**1** while lowering the nip pressure between the collecting roller **62** and the fixing roller **40** is the possible extent. In a state in which the cleaning web **61** is spaced from the collecting roller **62** ((c) of FIG. **4**)), a set value of the pressure of the collecting roller urging spring **93** is ON, so that a contact state of the collecting roller **62** with the fixing roller **40** is maintained only by the self-weight of the collecting roller **62**.

The collecting roller **62** is rotated by rotation of the fixing roller **40** by transmitting a driving force from the fixing roller **40** to the collecting roller **62**. In a state in which the web **61** is contacted to the collecting roller **62** by the web roller **63**, when the fixing roller **40** is rotated, the toner collected from the fixing roller **40** onto the collecting roller **62** by rotation of the collect **62** rotated by the rotation of the fixing roller **40** is removed by the web **61**. In that case, the web **61** contacting the collecting roller **62** is gradually wound up in the arrow B direction, so that a fresh (new) portion thereof contacts the collecting roller **62** before an associated portion of the web **61** is saturated with the toner. With respect to a winding amount, during sheet passing, the web **61** is wound up in a distance of, e.g., 1 mm every 4 sheets on an A4-sized sheet basis. In this way, the winding-up roller **65** winds up the web **61** in a predetermined amount (e.g., 1 mm) every image heating of a predetermined number of sheets (e.g., 4 sheets). Further, during the operation in the cleaning mode, the winding-up roller **65** winds up the web **61** at a rate of, e.g., 0.5 mm/sec. In this way, during the recovering (process), the winding-up roller **65** winds up the web **61** in a predetermined amount (0.5 mm in width (length)) every lapse of a predetermined time (e.g., lapse of 1 sec). As a result, the collecting roller **62** can be cleaned by bringing a fresh (new) portion of the web **61** in contact with the collecting roller **61** before the associated portion of the web **61** is saturated with the toner.

In order to suppress the pulling-out phenomenon of the web **61** when the toner is deposited over the surface of the collecting roller **62** due to the jam generation or the like, the cleaning during the jam generation is made by first bringing the web **61** into contact with the collecting roller **62** at the low pressure (20N) and then by rotating the collecting roller **62**. For this reason, the finishing cleaning is made in a state in which the contact pressure is further increased (40N) after the (low pressure) cleaning is made for a certain time, and therefore even when the toner is deposited in the large amount by first performing the cleaning at the low pressure,

the normal reaction between the web **61** and the collecting roller **62** is lowered. As a result, the frictional force in the nip is lowered, so that the discharge (pulling-out) of the web **61** can be prevented. In this way, in this embodiment, a constitution in which the nip pressure between the web **61** and the collecting roller **62** is changed in multiple stages is employed.

For that reason, depending on a pressure N**2** between the web **61** and the collecting roller **62**, a pressure N**1** between the collecting roller **62** and the fixing roller **40** may preferably be changed. When a friction coefficient between the web **61** and the collecting roller **62** is μ2 and a friction coefficient between the collecting roller **62** and the fixing roller **40** is μ1, these factors may only be required that the pressure N**1** is small to the possible extent while satisfying: (N**2**×μ2)<(N**1**×μ1).

The friction coefficient μ1 between the collecting roller **62** and the fixing roller **40** is about 0.4-0.5 in a state in which the toner is interposed between the rollers, and the friction coefficient μ2 between the web **61** and the collecting roller **62** is about 0.7-0.8 a state in which the toner is interposed between the rollers.

Therefore, the pressure N**2** when the web **61** contacts the collecting roller **62** at the low pressure position is 20N, and therefore in order to satisfy: (N**2**×μ2)<(N**1**×μ1), the pressure N**1** is set at 45N (i.e., (0.8×40 N)<(0.4×45N).

When the finishing cleaning is made, the contact pressure of the web **61** is 40N, and therefore in order to satisfy: (N**2**×μ2)<(N**1**×μ1), the pressure N**1** is set at 90N (i.e., (0.8×40N)<(0.4×90N).

In a state in which the web **61** is spaced from the collecting roller **62**, a set value of the pressure of the collecting roller urging spring **93** is 0N, so that a contact state of the collecting roller **62** with the fixing roller **40** is maintained only by the self-weight of the collecting roller **62**.

The collecting roller **62** is rotated by the rotation of the fixing roller **40** by transmitting thereto the drive (driving force) from the fixing roller **40** with the rotation of the fixing roller **40**. By rotationally driving the fixing roller **40** in a state in which the web **61** is contacted to the fixing roller **40** by the web roller **63**, the collecting roller **62** is rotated, so that the toner, collected from the fixing roller **40**, remaining on the collecting roller **62** is removed by the cleaning web **61**. The cleaning web **61** contacting the collecting roller **62** is set so that the web **61** gradually wound up in the arrow B direction (FIG. **3**) and thus a fresh portion of the web **61** is contacted to the collecting roller **62** before the associated portion of the web **61** is saturated with the toner.

Next, with reference to FIG. **5**, a control system in this embodiment will be described. FIG. **5** is a block diagram showing the control system for effecting contact-and-separation control of the cleaning unit **60** in this embodiment.

That is, the printer **16** (FIG. **1**) includes an entire system controller **200** for effecting integral control of the respective portions, and the fixing device controller **202** is connected with the entire system controller **200**.

In the fixing device controller **202**, a plurality of counters **204** are provided. To the fixing roller controller **202**, a cleaning unit controller **203**, a remaining detecting sensor **205**, the fixing roller temperature detecting sensor **42***a*, the fixing roller heater **40***a* and the fixing roller motor **211** are connected. Further, to the fixing device controller **202**, an opposite roller temperature detecting sensor **42***a*, the opposite roller heater **41***a*, an opposite roller motor **213** and a collecting roller mounting-and-demounting motor **212** are connected.

To the unit controller **203** described above, a home position sensor **208** for detecting a home position of the web roller **63** relative to the collecting roller **62** and a web mounting-and-demounting motor **209** for mounting and demounting the web **61** relative to the collecting roller **62** by rotating the mounting-and-demounting cam **91** are connected. Further, to the unit controller **203**, the web feeding motor **210** for winding up the web **61** by rotating the winding-up roller **65** is connected.

The fixing device controller (control means) **202** effects the following control in accordance with an instruction from the entire system controller **200**, on the basis of detection signals from the fixing roller temperature detecting sensor **42***a* and the opposite roller temperature detecting sensor **42***b*. That is, the controller **202** contacts not only the cleaning unit **60** via the cleaning unit controller **203** but also each of the fixing roller heater **40***a*, the fixing roller motor **211**, the collecting roller mounting-and-demounting motor **212**, the opposite roller heater **41***a* and the opposite roller motor **213**.

The fixing device controller **202** is constituted so that an operation in a first cleaning mode ((a) of FIG. **4**), an operation in a second cleaning mode ((b) of FIG. **4**), and an operation in a separation mode ((c) of FIG. **4**) are executable. In the operation in the first cleaning mode ((a) of FIG. **4**), by controlling the pressure switching mechanism (first switching means) **33** and the moving mechanism (second switching means) **32**, the collecting roller (rotatable collecting member) **62** is contacted to the fixing roller (rotatable member) **40** at a first pressure (low pressure: e.g., 20N).

In the operation in the second cleaning mode ((b) of FIG. **4**), by controlling the pressure switching mechanism **33** and the moving mechanism **32**, the collecting roller (rotatable cleaning member) **62** can be contacted to the fixing roller (rotatable member) **40** at a second position (high pressure: e.g., 45N) higher than the first position. In the operation in the separation mode, by controlling the pressure switching mechanism **33** and the moving mechanism **32**, the web roller **63** is spaced from the collecting roller **62**.

In this embodiment, in both of the operations in the first cleaning mode and the second cleaning mode, the frictional forces are set so that the first frictional force (F**1** in FIG. **2**) between the collecting roller **62** and the fixing roller **40** is larger than the second frictional force (F**2** in FIG. **2**). The second frictional force is the frictional force between the web **61** as the cleaning member and the collecting roller **62** as the rotatable cleaning member. Further, the frictional forces are set via the pressure switching mechanism **33** and the moving mechanism **32** so that the first frictional force (F**1** in FIG. **2**) is larger than the second frictional force (F**2** in FIG. **2**) in both of the operations in the first and second cleaning modes.

The cleaning unit controller **203** rotates the mounting-and-demounting cam **91** by driving the web mounting-and-demounting motor **209** while discriminating the position of the web roller **63** relative to the collecting roller **62** by the home position sensor **209**. At the same time, the web **61** is mounted on and demounted from the collecting roller **62** while being wound up by drive of the web feeding motor **210**.

The remaining detecting sensor **205** detects the recording material S remaining in the fixing device **9** during jam generation or the like, and then sends a detection signal of the recording material S to the fixing device controller **202**.

The fixing roller temperature detecting sensor **42***a* detects the surface temperature of the fixing roller **40**, and then sends its detection signal to the fixing device controller **202**.

A heat generation temperature of the fixing roller heater **40***a* is adjusted by control by the fixing device controller **202**, so that the surface temperature of the fixing roller **40** is adjusted, but adjusts the surface temperature of the collecting roller (rotatable cleaning member) **62** on the basis of the surface temperature of the fixing roller **40**. The fixing roller motor **211** rotates the fixing roller **40** in the arrow K direction in FIG. **2** by the control by the fixing device controller **202**.

The opposite roller temperature detecting sensor **42***b* detects the surface temperature of the opposite roller **41**, and then sends its detection signal to the fixing device controller **202**. A heat generation temperature of the opposite roller heater **31***a* is adjusted by the control by the fixing device controller **202**, so that the opposite roller heater **41***a* adjusts the surface temperature of the opposite roller **41**. The opposite roller motor **213** rotates the opposite roller **41** in the arrow L direction in FIG. **2** by the control by the fixing device controller **202**.

The fixing device controller **202** rotates the collecting roller urging cam **95** by driving the collecting roller mounting-and-demounting motor **212** while discriminating the position of the collecting roller **62** relative to the fixing roller **40**, so that the collecting roller **62** is contacted to and spaced from the fixing roller **40**.

Next, the action (function) of this embodiment will be described with reference to FIGS. **4** and **6**. FIG. **6** is a flowchart for illustrating a process of carrying out normal cleaning, low pressure cleaning and high pressure cleaning.

That is the fixing device controller **202** executed in accordance with an instruction from the entire system controller **200** detects, via the remaining detecting sensor **205**, whether or not the recording material S exists in the fixing device **9** during the jam generation.

In the case where absence of the recording material S in the fixing device becomes clear after jam clearance (S**300**) ("NO" of S**301**), normal cleaning is started (S**310**).

In the normal cleaning, first, the fixing device controller **202** turns on the fixing roller heater **40***a* provided inside the fixing roller **40**, and the temperature of the fixing roller **40** is increases so as to become a target temperature T**1** (140° C.) while being measured by the fixing roller temperature detecting sensor **42***a* (S**311**). Then, when the surface temperature of the fixing roller **40** reaches the target temperature T**1** (140° C.) ("YES" of S**312**), the fixing device controller **202** starts a web-up operation of winding-up the web **61** (S**313**). By drive of the web feeding motor **21**, the winding-up end portion **61***b* of the web **61** is wound up about the winding-up roller **65** at a speed of 1.0 mm/sec. Subsequently, rotation of the fixing roller **40** is started at a speed V**1** (e.g., 200 mm/sec) (S**314**), so that the collecting roller **62** is rotated by the rotation of the fixing roller **40**. Therefore, the rotational speed of the collecting roller **62** equals to the speed V**1** (200 mm/sec).

Thereafter, a mounting operation of mounting the cleaning unit **60** and a pressing operation of pressing the collecting roller **62** are started at a high pressure position, and the mounting-and-demounting cam **91** is rotated to a position where a nip pressure (N**2**) between the web roller **63** and the collecting roller **62** is 40N, so that the web **61** is contacted to the collecting roller **62**. At the same time, the urging cam **95** is rotated so that a pressure N**1** between the collecting roller **62** and the fixing roller **40** is 90N (S**315**). Hereinafter, this position is referred to as the high pressure position ((a) of FIG. **4**). In this case, $(N2\times\mu2)<(N1\times\mu1)$ holds, and therefore the slip of the collecting roller **62** with the fixing roller **40** can be prevented. Further, jammed paper is in a state in which the jammed paper does not exist in the fixing device ("NO" of S**301**), and therefore also the amount of the toner on the collecting roller **62** is small. Accordingly, even when the pressure of the collecting roller **62** is increased, the transfer-back of the toner onto the fixing roller **40** does not generate.

The fixing device controller **202** starts count of the cleaning for a certain time t**1** (e.g., 40 sec) by a counter **204** (S**316**). Then, when the counter **204** reaches the certain time t**1** ("YES" of S**317**), the rotation of the fixing roller **40** is stopped (S**318**), and then the web feeding motor **210** is stopped, and thus the winding-up of the web **61** is stopped (S**319**).

Thereafter, the fixing device controller **202** starts a separating (spacing) operation of separating (spacing) the cleaning unit **60** and a pressure-reducing operation of the collecting roller **62** (S**320**). Then, when the cleaning unit **60** reaches a separated (spaced) position and the collecting roller urging cam **95** reaches a position where the pressure of the collecting roller urging spring **92** for the collecting roller **62** is 0N ((c) of FIG. **4**), a normal cleaning flow is ended (S**321**).

On the other hand, during jam generation, in the case where the controller **202** discriminates, via the remaining detecting sensor **205**, that the recording material S remains in the fixing device ("YES" of S**301**), the fixing device controller **202** starts low pressure and finishing cleaning (S**330**).

In the case where the jam generates in the fixing device due to improper separation of the recording material S or the like, the recording material S adheres to the fixing roller **40** or the collecting roller **62**, so that the toner is deposited over the surface of the collecting roller **62** in some cases. After the jam, when the collecting roller **62** is rotationally driven for cleaning the collecting roller **62** in a state of contact of the web **61** with the collecting roller **62** at a pressure of not less than a certain value, there is liability that the toner is transferred back in a large amount onto the fixing roller **40**. Further, there is a possibility that the web **61** is pulled due to a viscoelastic property and an adhesive property of the toner deposited on the collecting roller **62**, so that the web **61** is reversely rotated, and thus the web **61** is pulled out.

A one-way gear (not shown) for preventing reverse rotation is provided at the winding-up end portion **61***b*, and therefore a center shaft of the web-up end portion **61***b* is not rotated, but when the web **61** remains in a large amount in the web-up side, there is a possibility that the web **61** is pulled out while being tightly squeezed. When the winding-up side web **61** is pulled out, the web **61** becomes entangled with the collecting roller **62** or the fixing roller **40**, so that there is a possibility that tearing of the web **61**, breakage of the fixing roller **40** and breakage of the sensors and the respective members which contact the fixing roller **40** are caused to generate.

Therefore, by first cleaning the collecting roller **62** at the low pressure, the normal reaction between the web **61** and the collecting roller **62** is lowered even when the toner is deposited in the large amount on the collecting roller **62**, so that the frictional force in the nip can be lowered, and thus it is possible to prevent the web **61** from being discharged (pulled out).

Further, the collecting roller **62** is rotated by the fixing roller **40**, and therefore, it is preferable that the frictional force F**1** between the collecting roller **62** and the fixing roller **40** is higher during the drive than the frictional force F**2** between the web **61** and the collecting roller **62** (i.e., $(N2\times\mu2)<(N1\times\mu1)$).

Further, when the toner exists in the large amount on the collecting roller **62**, when the nip pressure (N**1**) between the collecting roller **62** and the fixing roller **40** is in a high state the toner collected from the fixing roller **40** is transferred back onto the fixing roller **40**. For that reason, it is preferable that the pressure N**1** is minimized while satisfying: (N**2**×μ2)<(N**1**×μ1).

Therefore, the pressure N**2** when the web **61** contacts the collecting roller **62** at the low pressure is 20N, and therefore in order to satisfy: (N**2**×μ2)<(N**1**×μ1), the collecting roller urging cam **95** is rotated so that the pressure N**1** is 45N. As a result, the urging force of the collecting roller urging spring **93** is adjusted ((0.8×20N)<(0.4×45N)).

First, the fixing device controller **202** turns on the fixing roller heater **40***a* in the fixing roller **40**, and controls the turning-on of the fixing roller heater **40***a*, while measuring the surface temperature of the fixing roller **40** by the temperature detecting sensor **42***a*, so that the surface temperature is a target temperature T**1** (e.g., 140° C.) (S**331**). When the temperature of the fixing roller **40** reaches the target temperature T**2** (140° C.) ("YES" of S**332**), the controller **202** starts a web-up operation of winding-up the web **61** (S**333**). The fixing device controller **202** drives the web feeding motor **21**, so that the winding-up end portion **61***b* of the web **61** is wound up about the winding-up roller **65** at a speed of, e.g., 1.0 mm/sec.

Subsequently, rotational drive of the fixing roller **40** is started at a speed V**1** (e.g., 200 mm/sec) (S**334**), so that the collecting roller **62** is driven by the rotational drive of the fixing roller **40**. Therefore, the rotational speed of the collecting roller **62** equals to the speed V**1** (200 mm/sec).

Thereafter, the fixing device controller **202** starts a mounting operation of mounting the cleaning unit **60** and a pressing operation of pressing the collecting roller **62**, and rotates the mounting-and-demounting cam **91** to a position where a nip pressure (N**2**) between the web roller **63** and the collecting roller **62** is, e.g., 20N, so that the web **61** is contacted to the collecting roller **62** (S**335**). At the same time, the urging cam **95** is rotated so that a pressure between the collecting roller **62** and the fixing roller **40** is, e.g., 45N (S**335**). Hereinafter, this position is referred to as the low pressure position ((b) of FIG. **4**).

Then, the fixing device controller **202** carries out the cleaning for a certain time t**3** (e.g., 20 sec) counted by the counter **204** (S**336**). Then, when the counter **204** reaches the certain time t**3** ("YES" of S**337**), the cleaning unit **60** is moved as follows. That is, the cleaning unit **60** is moved to the high pressure position ((a) of FIG. **4**) where the nip pressure (N**2**) between the web roller **63** and the collecting roller **62** is, e.g., 40N and the nip pressure (N**1**) between the collecting roller **62** and the fixing roller **40** is, e.g., 90N (S**338**), and then finishing cleaning is started.

As described above, the fixing device controller **202** as an executing portion executes the operation in the cleaning mode, during the restoring process after the jam clearance, in such a manner that the collecting roller **62** is cleaned at the low pressure position (in the operation in the first cleaning mode) shown in (b) of FIG. **4** and at the high pressure position (in the operation in the second cleaning mode) shown in (a) of FIG. **4** in the listed order. In a low pressure state, when the cleaning is made to some extent, the toner, in a very small amount, which cannot be completely removed at the low pressure remains on the surface of the collecting roller **62**. In order to clean the surface of the collecting roller **62**, after the cleaning for the certain time at the low pressure, the contact pressure is increased and the finishing cleaning is carried out for a certain time, so that the residual toner can be properly removed.

When the toner is deposited on the collecting roller **62** as it is, the toner is deposited again on the collecting roller **62**, so that an image defect generates. Further, when the collecting roller **62** is kept at the low pressure position, the collecting roller **62** slips with the fixing roller **40**, and therefore when the contact pressure of the web **61** is increased, also the contact pressure between the collecting roller **62** and the fixing roller **40** is required to be increased correspondingly.

The fixing device controller **202** carried out the cleaning for a certain time t**4** (40 sec) by a counter **204** (S**339**), and then, when the counter **204** reaches the certain time t**4** ("YES" of S**340**), the rotation of the fixing roller **40** is stopped (S**341**). Then, the web feeding motor **210** is stopped, and thus the winding-up of the web **61** is stopped (S**342**). Thereafter, the controller **202** starts a separating (spacing) operation of separating (spacing) the cleaning unit **60** and a pressure-reducing operation of the collecting roller **62** (S**343**). Then, at the time when the cleaning unit **60** reaches a separated (spaced) position and the collecting roller urging cam **95** reaches a position where the pressure of the collecting roller urging spring **92** for the collecting roller **62** is 0N ((c) of FIG. **4**), a low pressure and finishing cleaning flow (sequence) is ended (S**344**).

<Second Embodiment>

Next, with reference to (a) and (b) of FIG. **7**, Second Embodiment of the present invention will be described. In this embodiment, members identical to those in First Embodiment are represented by the same reference numerals or symbols, and constitutions and functions of the members are the same as those in the above-described embodiment will be omitted from description. This embodiment is substantially the same as First Embodiment except that a collecting roller urging spring **97** (FIG. **7**) or the like is provided in place of the pressure switching mechanism **33** and the web roller urging spring **92** which are shown in FIG. **3** and which are omitted from this embodiment and that first and second pressing portions **90***e* and **90***f* for pressing the urging spring **97** are provided.

That is, in this embodiment, in the moving mechanism **32** side, the mounting-and-demounting cam **91**, the web roller urging spring **92** and the unit urging spring **96** which are shown in FIG. **3** in First Embodiment are similarly used. Further, in this embodiment, in the pressure switching mechanism **33** side (FIG. **3**), none of the collecting roller urging spring **93**, the collecting roller arm **94** and the collecting roller urging cam **95** is used, and in place of these members, the collecting roller urging spring **97** shown in (a) and (b) of FIG. **7** is used.

In this embodiment, as shown in (a) and (b) of FIG. **7**, a roller supporting member **100** for supporting the collecting roller **62** and the fixing roller **40** is provided. The roller supporting member **100** is provided with an opening **100***a* through which the rotation shaft **62***a* of the collecting roller **62** is supported via a bearing **102**. The opening **100***a* is formed in an elliptical shape inclined from an upper-left portion toward a lower-right portion in (a) and (b) of FIG. **7**. In a state in which the rotation shaft **62***a* is rotatably supported by the bearing **102**, the collecting roller **62** is supported so as to be movable in an oblique direction in the opening **100***a* and is also urged by an unshown urging member toward the upper-left portion in the opening **100***a*.

In the neighborhood of the opening **100***a* of the roller supporting member **100**, a spring supporting shaft **99** is fixed so as to project toward the front side on the drawing sheet

of (a) and (b) of FIG. **7**. On the spring supporting shaft **99**, the collecting roller urging spring **97** as an urging portion is mounted so that a coil portion thereof is wound around the spring supporting shaft **99**. The collecting roller urging spring **97** is constituted by a coil-shaped torsion spring and functions so as to urge the collecting roller **62** toward the fixing roller **40**.

The roller supporting member **100** includes a locking portion **100***b* formed at an upper portion of the opening **100***a*. The collecting roller urging spring **97** wound at the coil portion thereof about the spring supporting shaft **99** is engaged at one end portion **97***a* thereof with the locking portion **100***b* from below so that the end portion **97***a* is contactable to an outer peripheral surface of the bearing **102** projected from the opening **100***a*. In this state, the other end portion **97***b* of the collecting roller urging spring **97** is open as a free end portion. The other end portion **97***b* is formed in a length shorter than the length of the end portion **97***a*.

In this embodiment, a shaft supporting hole **90***b* provided in the roller supporting plate **90** is constituted in a circular shape, not the elongated shape as in First Embodiment. With this circular shaft supporting hole **90***b*, the rotation shaft **63***a* (FIG. **4**) of the web roller **63** is freely engaged via an unshown bearing. In this embodiment, a constitution in which an approaching operation of the web roller **63**, toward the collecting roller **62**, supported rotatably the circular shaft supporting hole **90***b* and supported immovably in a radial direction of the shaft supporting hole **90***b* is absorbed in a side where the collecting roller **62** is urged obliquely upward in the opening **100***a* is employed.

The moving mechanism **32** in this embodiment moves the cleaning unit **60** relative to the collecting roller **62** so that the cleaning unit **60** is movable between a first position where the web **61** contacts the collecting roller **62** and a second position where the web **61** contacts the collecting roller **62** at a contact pressure lower than a contact pressure at the first position. This moving operation is, similarly as in First Embodiment, properly controlled by the fixing device controller **202** by controlling the angle of rotation of the mounting-and-demounting cam **91** by the fixing device controller **202**.

The unit **60** in this embodiment includes the first pressing portion **90***e* for pressing the collecting roller **62** in contact with the collecting roller **62** when the unit **60** is in the first position, and includes the second pressing portion **90***f* for pressing the collecting roller **62** via the collecting roller urging spring (urging portion) **97** when the unit **60** is in the second position. In a state in which the collecting roller **62** is not urged by the first and second pressing portions **90***e* and **90***f*, the bearing **102** is contacted to an upper and inner peripheral portion of the opening **100***a* and is kept at the position, and thus the collecting roller **62** is constituted so as to be in the spaced state similarly as in the state of (c) of FIG. **4**.

When the cleaning unit **60** (FIG. **3**) is in the first position, the collecting roller **62** is urged so that the frictional force F**2** between the collecting roller **62** and the web **61** is smaller than the frictional force F**1** between the collecting roller **62** and the fixing roller **40**. The first position is similar to the high pressure position shown in (a) of FIG. **4**. At the first position, in (a) of FIG. **7**, when the other end portion **97***b* is strongly pushed by the first pressing portion **90***e* to a position indicated by a chain double-dashed line ((b) of FIG. **7**), the first pressing portion **90***e* of the roller supporting plate **90** directly contacts and presses the bearing **102**.

In this case, the other end portion **97***b* is strongly pushed in, and the bearing **102** is further strongly pushed in the end portion **97***a*, so that the web roller **63** is contacted to the collecting roller **62** at the high pressure with movement of the roller supporting plate **90**. As a result, the frictional force F**1** generates between the collecting roller **62** and the fixing roller **40**. Accordingly, the frictional force F**2** generated between the collecting roller **62** and the web **61** by the contact of the web roller **63** with the collecting roller **62** caused only by movement of the roller supporting plate **90** is smaller than the frictional force F**1** to which the urging force of the urging spring **97** is added, so that the relationship of F**2**<F**1** is maintained.

On the other hand, when the cleaning unit **60** (FIG. **3**) is in the second position, the collecting roller **62** is urged via the collecting roller urging spring (urging portion) **97** so that the frictional force F**2** between the collecting roller **62** and the web **61** is smaller than the frictional force F**1** between the collecting roller **62** and the fixing roller **40**. That is, at this time, the cleaning unit **60** is in a state in which the cleaning unit **60** contacts the collecting roller urging spring **97** without contacting the collecting roller **62**. The second position is similar to the low pressure position shown in (b) of FIG. **4**. In (a) of FIG. **7**, when the other end portion **97***b* is strongly pushed by the second pressing portion **90***f* to a position indicated by a chain line ((b) of FIG. **7**), the end portion **97***a* rotating in the clockwise direction in the figure presses the bearing **102**, so that the second position is obtained. That is, when the cleaning unit **60** is in this position, the roller supporting plate **90** (**90***f*) urges the bearing **102** only via the collecting roller urging spring **97**.

In this case, the other end portion **97***b* is weakly pushed in, and the bearing **102** is weakly pushed in the end portion **97***a*, so that the web roller **63** is contacted to the collecting roller **62** at the low pressure with movement of the roller supporting plate **90**. As a result, the frictional force F**1** generates between the collecting roller **62** and the fixing roller **40**. Accordingly, the frictional force F**2** generated between the collecting roller **62** and the web **61** by the contact of the web roller **63** with the collecting roller **62** caused only by movement of the roller supporting plate **90** is smaller than the frictional force F**1** to which the urging force of the urging spring **97** is added. For that reason, also in this case, the relationship of F**2**<F**1** is maintained.

Further, a position similar to the separated position shown in (c) of FIG. **4** is obtained by positioning the second pressing portion **90***f* at a solid-line position, in (a) and (b) of FIG. **7**, where the second pressing portion **90***f* does not contact the other end portion **97***b*.

As described above, the first position, the second position and the separated position can be obtained simply and reliably only by changing the positions of the first and second pressing portions **90***e* and **90***f* relative to the collecting roller urging spring **97** and the bearing **102** in the moving operation of the above-described plate **90** on the basis of the control of the mounting-and-demounting cam **91**. As a result, it becomes possible to suppress the slip of the collecting roller **62** while avoiding the transfer-back of the toner from the collecting roller **62** onto the fixing roller **40**.

Also in this embodiment, the fixing device controller **202** as an executing portion executes the operation in the cleaning mode, during the restoring process after the jam clearance, in such a manner that the collecting roller **62** is cleaned at the low pressure position (second position shown in (b) of FIG. **4**) and at the high pressure position (first position shown in (a) of FIG. **4**) in the listed order. In a low pressure state, when the cleaning is made to some extent, the toner, in a very small amount, which cannot be completely removed at the low pressure remains on the surface of the

collecting roller **62**. In order to clean the surface of the collecting roller **62**, after the cleaning for the certain time at the low pressure, the contact pressure is increased and the finishing cleaning is carried out for a certain time, so that the residual toner can be properly removed.

Also in this embodiment, the web **61** contacting the collecting roller **62** is gradually wound up, so that the fresh portion contacts the collecting roller **62** before the associated portion of the web **61** is saturated with the toner. With respect to a winding amount, during sheet passing, the web **61** is wound up in a distance of, e.g., 1 mm every 4 sheets on an A4-sized sheet basis. In this way, the winding-up roller **65** winds up the web **61** in a predetermined amount (e.g., 1 mm) every image heating of a predetermined number of sheets (e.g., 4 sheets). Further, during the operation in the cleaning mode, the winding-up roller **65** winds up the web **61** at a rate of, e.g., 0.5 mm/sec. In this way, during the recovering (process), the winding-up roller **65** winds up the web **61** in a predetermined amount (e.g., 0.5 mm in width (length)) every lapse of a predetermined time (e.g., lapse of 1 sec). As a result, the collecting roller **62** can be cleaned by bringing a fresh (new) portion of the web **61** in contact with the collecting roller **61** before the associated portion of the web **61** is saturated with the toner.

<Third Embodiment>

Next, with reference to FIG. **8**, Third Embodiment of the present invention will be described. In this embodiment, members identical to those in First Embodiment are represented by the same reference numerals or symbols, and constitutions and functions of the members are the same as those in the above-described embodiment will be omitted from description.

In this embodiment, as shown in FIG. **8**, in a pressing method of the collecting roller **62**, a constitution in which the collecting roller **62** is pressed toward the fixing roller without using the collecting roller urging arm **94** and the collecting roller urging cam **95** and the like is employed. That is, in a state in which a lower end portion of a collecting roller urging spring **101** provided at a position of being pressed by the roller supporting plate **90** of the cleaning unit **60** is contacted to the rotation shaft **62***a* of the collecting roller **62**, an upper end portion of the collecting roller urging spring **101** is pressed by the roller supporting plate **90**. As a result, the collecting roller **62** is pressed toward the fixing roller **40**.

In this embodiment, a spring movable to a position by the roller supporting plate **90** changed in position depending on the low pressure position and the high pressure position of the cleaning unit **60** is selected and used as the collecting roller urging spring **101**. For this reason, a simpler constitution can be realized, so that even in the case where the contact pressure of the web **61** is changed in the multiple stages, it is possible to suppress the transfer-back of the toner from the collecting roller **62** onto the fixing roller **40**, damage on and generation of the recessed portion of the fixing roller **40**, and the slip of the collecting roller **62**. As a result, it becomes possible to provide the printer **16** capable of realizing a stable end product.

As described above, according to First to Third Embodiments, even in a state in which the toner is deposited over the surface of the collecting roller **62** after the jam generation or the like, the collecting roller **62** can be cleaned properly without pulling out the web **61**. Further, the web **61** has a constitution in which the contact pressure thereof varies in the multiple stages in order to prevent the pulling-out thereof, and therefore by setting also the contact pressure of the collecting roller **62** so as to vary in the multiple stages depending on the contact pressure of the web **61**, it is possible to lower the pressure of the collecting roller **62** while maintaining the relationship of F**2**<F**1**. As a result, it is possible to prevent the transfer-back of the toner from the collecting roller **62** onto the fixing roller **40** and the slip of the collecting roller **62**, so that the damage on and generation of the recessed portion of the fixing roller **40** can be suppressed and thus it becomes possible to provide a stable end product for a long term.

While the invention has been described with reference to the structures disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purpose of the improvements or the scope of the following claims.

This application claims priority from Japanese Patent Application No. 045862/2014 filed Mar. 10, 2014, which is hereby incorporated by reference.

What is claimed is:

1. An image heating apparatus comprising:

a heat rotatable member configured to heat a toner image on a recording material;

a collecting roller configured to collect a toner deposited on said heat rotatable member while being rotated by said heat rotatable member;

a bearing configured to rotatably support a longitudinal end portion of said collecting roller;

a holding member configured to hold said bearing;

a spring provided on said holding member and configured to act on said bearing by contacting said bearing;

a cleaning unit including a cleaning web configured to clean said collecting roller member; and

a moving mechanism configured to move said cleaning unit so as to be movable between a first position where said cleaning web contacts said collecting roller and a second position where said cleaning web contacts said collecting roller at a contact pressure lower than a contact pressure at the first position,

wherein said cleaning unit includes (i) a first pressing portion configured to press said collecting roller toward said heat rotatable member by contacting said bearing when said cleaning unit is in the first position, and (ii) a second pressing portion configured to press said collecting roller toward said heat rotatable member by contacting said spring without contacting said bearing when said cleaning unit is in the second position.

2. The image heating apparatus according to claim **1**, wherein said second pressing portion presses said collecting roller via said spring so that the frictional force between said collecting roller and said cleaning web is smaller than the frictional force between said collecting roller and said heat rotatable member.

3. The image heating apparatus according to claim **1**, wherein said first pressing portion presses said collecting roller so that the frictional force between said collecting roller and said cleaning web is smaller than the frictional force between said collecting roller and said heat rotatable member.

4. The image heating apparatus according to claim **1**, further comprising an executing portion configured to execute an operation in a cleaning mode in which said collecting roller is cleaned at the second position and the first position in this order during a recovery process after jam clearance.

5. The image heating apparatus according to claim **1**, wherein said cleaning unit includes a roller about which said cleaning web is wound and a winding up roller configured to wind up said cleaning web, and

wherein said winding up roller winds up a predetermined amount of said cleaning web for every image heating of a predetermined number of sheets.

6. The image heating apparatus according to claim **1**, wherein said cleaning unit includes a roller about which said cleaning web is wound and a winding up roller configured to wind up said cleaning web, and

wherein said winding up roller winds up a predetermined amount of said cleaning web for every lapse of a predetermined time.

7. The image heating apparatus according to claim **1**, wherein said collecting roller is in contact with said heat rotatable member when said cleaning unit is in the first position and the second position.

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